

Name \_\_\_\_\_

22M:005

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Score (100 possible) \_\_\_\_\_

Exam #2

Answer each question to the best of your ability. Show all of your work.

1. Solve each of the following equations for exact solutions over the interval  $[0, 360^\circ)$ . (6 points each)

a.  $\cos^2 x + 2\cos x + 1 = 0$

b.  $\cos^2 x - \sin^2 x = 0$

c.  $\cot 3x = \sqrt{3}$

d.  $\sqrt{2} \sin 3x + 2 = 3$

e.  $\sin^2 x = 1$

f.  $2\tan x - 1 = 0$

2. Verify each of the following identities. (7 points each)

a. 
$$\sin \theta + \cos \theta = \frac{\sin \theta}{1 - \frac{\cos \theta}{\sin \theta}} + \frac{\cos \theta}{1 - \frac{\sin \theta}{\cos \theta}}$$

b. 
$$\frac{1 + \cos 2\theta}{\sin \theta} = \cot \theta$$

3. Give the exact value for each of the following expressions. (5 points each)

a. 
$$\tan\left(\arccos \frac{3}{4}\right)$$

b. 
$$\sin\left(2 \tan^{-1} \frac{1}{3}\right)$$

4. Use identities to solve each of the following expressions. (5 points each)

a. Find  $\tan(-x)$  if  $\tan(x) = 5$ .

b. Find  $\sin(x + y)$  given  $\sin x = -\frac{1}{4}$ ,  $\cos y = -\frac{4}{5}$  and both  $x$  and  $y$  lie in quadrant III.

5. Give the exact real number value of  $y$  in each of the following. (5 points each)

a.  $y = \sin^{-1} \frac{\sqrt{2}}{2}$

b.  $y = \sec^{-1} \frac{2\sqrt{3}}{3}$

c.  $y = \cot^{-1}(-1)$

6. Solve each of the following equations for  $x$ . (5 points each)

a.  $4y = 2\sin x$

b.  $2y = 3\tan(3x+2)$

c.  $\cos^{-1} x + \tan^{-1} 1 = \frac{11\pi}{12}$

EXTRA CREDIT: Suppose the ends of the cylindrical storage tank in the figure are circles of radius 3 feet and the cylinder is 20 feet long. Determine the volume of water in the tank if the depth of the water is 2 feet. (10 points max)

